

WHAT IS CLAIMED IS:

1. A system for automatically matching preamplifiers in a microphone array, comprising:  
5 injecting at least one excitation pulse into each preamplifier in the microphone array;  
measuring each preamplifier output response to each excitation pulse;  
performing a frequency-domain analysis of the measured preamplifier output response to each excitation pulse; and  
10 computing frequency-domain compensation gains from the results of the frequency-domain analysis for matching the output of each preamplifier.
2. The system of claim 1 wherein two or more excitation pulses are injected into each preamplifier in the microphone array, and wherein the  
15 measured preamplifier output response for each preamplifier is the average response to each excitation pulse.
3. The system of claim 1 wherein the microphone array further comprises a computer interface for connecting the array to an external computing  
20 device.
4. The system of claim 3 wherein the at least one excitation pulse is automatically generated by the microphone array in response to a pulse generation command from the external computing device via the computer  
25 interface.
5. The system of claim 3 wherein the microphone array further comprises an integral memory for maintaining a set of parameters defining operational characteristics of the microphone array.

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6. The system of claim 5 wherein the set of parameters defining operational characteristics of the microphone array is automatically reported to the external computing device via the computer interface.

5 7. The system of claim 6 wherein the set of parameters defining operational characteristics of the microphone array includes information defining the computed frequency-domain compensation gains for each preamplifier in the array.

10 8. The system of claim 3 wherein the computer interface for connecting the array to the external computing device is any of a wired and a wireless computer interface.

9. A method for automatically matching preamplifier frequency-domain responses in a microphone array, comprising using a computing device to:

15 generate at least one analog excitation pulse of a predetermined phase, magnitude and duration and provide the at least one generated analog excitation pulse to an input of each preamplifier in a microphone array;

20 digitize an output resulting from each excitation pulse for each preamplifier in the microphone array;

perform a frequency-domain analysis of the digitized output for each preamplifier in the microphone array; and

25 compute frequency-domain compensation gains from the results of the frequency-domain analysis for matching the output of each preamplifier in the microphone array with each other.

10. The method of claim 1 wherein for each analog excitation pulse provided to the input of each preamplifier in a microphone array, the resulting digitized outputs are averaged, and wherein the averaged digitized output for each preamplifier is used to perform the frequency-domain analysis and to

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compute the frequency-domain compensation gains from the results of the frequency-domain analysis.

11. The method of claim 9 wherein the computed frequency-domain  
5 compensation gains are used to automatically configure audio processing  
software operating within an external computing device to reflect a current  
configuration of the microphone array, said microphone array being coupled to  
the external computing device via any of a wired and a wireless computer  
interface.

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12. The method of claim 9 wherein the computed frequency-domain  
compensation gains are stored locally within the microphone array within a  
microphone array memory.

13. The method of claim 12 wherein the microphone array memory  
15 further includes information defining microphone types and geometry for each  
microphone in the microphone array, and a microphone array working volume for  
each microphone in the microphone array.

14. The method of claim 12 wherein the microphone array memory is a  
20 programmable memory, and wherein the information stored within the  
programmable memory in an addressable lookup table.

15. A system for automatically calibrating preamplifiers in a microphone  
25 array to provide matched preamplifier outputs, comprising:

a microphone array including at least one microphone, each microphone  
further including at least one preamplifier;

said microphone array further including a switchable pulse generation  
circuit for generating excitation pulses of a predetermined duration, magnitude  
30 and phase;

remotely initiating generation of at least one excitation pulse in the switchable pulse generation circuit from a remote computing device coupled to the microphone array via a computer interface;

automatically injecting each excitation pulses into each preamplifier;

5       measuring an output resulting from each injected excitation pulse for each preamplifier;

providing the measured output for each preamplifier to the remote computing device via the computer interface;

10       on the remote computing device, performing a frequency-domain analysis of the measured output for each preamplifier; and

computing frequency-domain compensation gains from the results of the frequency-domain analysis for matching the output of each preamplifier in the microphone array with each other.

15       16.   The system of claim 15 wherein the measured output for each preamplifier is averaged with each other measured output for each individual preamplifier, and wherein the averaged output for each preamplifier is provided as the measured output for each preamplifier to the remote computing device via the computer interface.

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17.   The system of claim 15 wherein the microphone array further includes at least one addressable memory for storing operational parameters of the microphone array; and

25       wherein the microphone array automatically reads the parametric information from the addressable memory and reports the parametric information to the external computing device via a computer interface, said external computing device being remotely coupled to the microphone array via the computer interface.

30       18.   The system of claim 15 wherein the microphone array further includes a set of at least one speaker for reproducing one or more audio signals.

19. The system of claim 15 wherein the computer interface is any of a wired and a wireless computer interface.

20. The system of claim 22 further comprising automatically configuring  
5 audio processing software operating within the external computing device to  
reflect the computed frequency-domain compensation gains for each preamplifier  
in the microphone array when processing audio signals being provided to the  
external computing device from the microphone array via the computer interface.

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